

VIII. *On the Mammals obtained by Mr. John Whitehead during his recent Expedition to the Philippines.* By OLDFIELD THOMAS. *With Field-notes by the Collector.*

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[PLATES XXX.—XXXVI.]

MR. JOHN WHITEHEAD, whose exploration of Mount Kina Balu has already rendered him famous as a collector, has during the last three years been engaged in the exploration of the islands of the Philippine group, partly at his own expense, and partly at that of the "subscribers to the Whitehead Fund," to whose generosity the National Museum owes the donation of the whole of the specimens that the subscribers had a claim to under Mr. Whitehead's agreement with them.

As the exploration has been so remarkably successful, it is only fitting that an acknowledgment of their generosity should be appended to this account of the Mammals obtained during the expedition. Their names are as follows:—Messrs. Matthew, James, and Andrew Arthur, the Duke of Bedford, Major Cooper Cooper, the late Mr. Alexander Dennistoun, Mr. John Dennistoun, the late Lady Huntingtower, the late Mr. Henry Seebohm, Mr. J. G. Sandeman, and Mr. J. T. Thomasson.

The Philippine Islands, however rich in birds, have always previously been looked upon as a group very poor in Mammals, especially in comparison with the rich faunas of the other islands of the East Indian Archipelago. This poverty was particularly evident in regard to really peculiar indigenous Mammals; for, with the exception of *Phlæomys cumingi*, scarcely a Mammal was known from the group other than members of widely-distributed genera, of which the Philippine species were either identical with or closely allied to Palawan, Bornean, or Celebean forms.

Little, therefore, could have been expected from the expedition further than the discovery of a few fresh species of genera known to inhabit the group, and this, so far as regards the islands other than Luzon, is just what has occurred. But in the great northern island of the group Mr. Whitehead has made a most wonderful and unexpected discovery, that of a new and peculiar Mammal-fauna inhabiting the Luzon highlands, and, so far as is yet known, mostly isolated on a small plateau on the top of Monte Data, in the centre of Northern Luzon, at an altitude of from 7000 to 8000 feet.

The plateau itself, as will be seen by Mr. Whitehead's notes below, is of extremely small size, but in spite of this fact he obtained there specimens of the following remarkable series of animals :—

*Crocidura grayi*.

*Felis domestica* (feral).

*Paradoxurus philippinensis*.

*Celænomys silaceus*. New genus and species.

*Chrotomys whiteheadi*. New genus and species.

*Rhynchomys soricoides*. New genus and species.

*Phlæomys pallidus*.

*Mus everetti*.

*Mus luzonicus*. New species.

*Mus decumanus* (feral).

*Mus chrysocomus*.

*Mus ephippium negrinus*.

*Batomys granti*. New genus and species.

*Carpomys melanurus* and *C. phæurus*. New genus and two new species.

*Crateromys schadenbergi*.

In addition to these, *Crunomys fallax*, a new genus and species, was obtained in the district of Isabella, east of Monte Data.

Therefore no less than six new genera and eight new species were discovered in the island, a proportion of novelty that has perhaps never been equalled in the history of Mammal-collecting.

Besides these new forms, Mr. Whitehead discovered a new genus and species of Bat in Mindoro and several additional species of Bats and Rodents in that and other islands.

What are the true affinities of the isolated fauna of Luzon is a question that is not easy to answer, for the representative forms are mostly so peculiar as to render their zoological relationships more or less doubtful. On the whole, the connections, such as they are, seem to be partly with Celebes and partly with the Australian region. Thus *Rhynchomys* seems to have its nearest ally (*Echiothrix*) in Celebes; *Mus chrysocomus* is actually a Celebean species; while *Chrotomys*, *Celænomys*, and *Crunomys* belong to a subfamily, the Hydromyinae, hitherto known only from Australia and New Guinea. Finally, *Crateromys* seems to have its nearest ally in *Lenomys* from Celebes, and in another new genus not yet described that occurs in New Guinea.

On the other hand, *Phlæomys* is so isolated that I can make no suggestions as to what is its nearest ally, and *Carpomys* and *Batomys* belong to a group of arboreal genera scattered over the oriental part of the East Indian Archipelago. This group of genera may possibly either have a definite alliance one to the other, independent

of *Mus*, or may be isolated survivors of an older murine fauna, of which *Mus* has now gained the dominant position, or finally may all be independent offshoots of the same central genus. Probably the second of these hypotheses approaches nearest to the truth, although one or two of the less differentiated genera, such as *Vandeleuria*, may have arisen in the third way.

In any case, Science is to be congratulated on the wonderful series of new forms which Mr. Whitehead's exploration of the little plateau of Monte Data has placed at her service, and I feel sure that, when they are studied by someone better able than I am to make out their complicated relationships, our general knowledge of geographical and phylogenetic evolution will be by their aid materially increased.

The following are Mr. Whitehead's general notes on the collection :—

“The Mammals were collected during a period of three years spent in the Philippine Islands. As my time was occupied chiefly with ornithology and no special effort was made to collect Mammals, the results may be looked upon as fairly satisfactory.

“The largest collection, and at the same time the most interesting, was formed in the highlands of the Province of Lepanto, North Luzon, chiefly on Monte Data, a table-topped mountain of from 7000 to 8000 feet in altitude. A few specimens come from Cape Engaño, the most northern point of East Luzon, and a few Rats and a new Bat from the highlands of Mindoro. In Negros very few Mammals were met with. In Samar several interesting forms were obtained, including *Tarsius philippensis*, but, with the exception of a new Pigmy Squirrel, all well known to naturalists.

“Monte Data, my chief collecting-ground, is inhabited by a peculiar wild tribe of Malays, not of Negrito stock, who call themselves Igorrotes. I found them very pleasant savages, and, fortunately for me, they knew the value of coins. By purchasing all the animals brought to my camp, I soon had quite thirty Igorrote collectors hard at work most of the day with their little terriers, digging out Rats and snaring the larger mammals and birds. The various small Rats they brought in alive—and often had their hands much bitten—as I refused to deal in dead specimens, the skulls being generally smashed to bits. In less than a month's time the tent was festooned with rat-skins hanging up to dry, my collection consisting of over one hundred specimens. A perusal of the list (see p. 378) will give the reader an idea of the Rodents obtained on this mountain.

“The table-top of Monte Data is perhaps over three miles long, by one mile (or more in places) broad. The vegetation consists chiefly of oaks and pines, all well clothed in lichen and other parasitic plants, but the undergrowth of bamboo, fern, and raspberry is very thick. The ground is much burrowed by Rats; and I may mention that the largest known species of Old-World Scops Owl comes from this place, showing that the food-supply is both abundant and nutritious. In Mindoro I was most unfortunate, visiting that island in the wet season. We were unable to leave our tent for days



together, and during three months only some five days were fine. A variety of the Common Rat was soon attracted to our camp, where it became quite a nuisance. In Negros my camp was also infested with Rats, many of which we trapped.

"The distribution of Mammalia throughout the Philippine Archipelago is most interesting, but the larger islands are by no means thoroughly explored—more especially Mindoro, Mindanao, and the Pacific coast of North and Central Luzon.

"In the larger islands of Luzon, Mindoro, Panay, Negros, and Cebu, we find neither *Tarsius*, *Galeopithecus*, nor *Sciurus*; but all these Bornean genera are found in Samar and Leite. *Tarsius* is wanting from Mindanao and Bohol, but when the larger island is explored it will doubtless be met with there also.

"In Luzon and Mindoro no indigenous *Felis* has yet been discovered; this genus occurring in Panay, Negros, and Cebu. Though it has not yet been obtained in Mindanao, I expect it will be eventually discovered in that great island.

"It is possible that *Felis* does not occur in Samar and Leite, as these islands are much more to the east and may have missed the migration—as apparently the Negros, Panay, and Cebu group have missed that of *Sciurus* and other genera. If *Felis* is confined to the Negros group, it seems probable that Man was the agent of introduction of this Bornean animal.

"Luzon has many wonderful Rodents peculiar to it, notably such genera as *Phloeomys* and *Crateromys*. In the island of Marinduque, *Phloeomys* also occurs; but this island, by its birds alone, is really a part of Luzon, from which island it is separated by a strait equal, however, to that which separates Luzon from Mindoro.

"Mindoro is remarkable for its Tamarau (*Bubalus mindorensis*), an animal perhaps more nearly allied to the Anoa of Celebes than to any other. It is interesting to notice the absence of such Bornean genera as *Tupaia*, *Mydaus*, *Arctictis*, *Hystrix*, and *Sciurus*, which are found in Palawan and the Calamianes, but have never been able to cross into Mindoro. There are, however, several Palawan birds in Mindoro which are not met with in any other of the true Philippine Islands.

"In the west-central islands Panay, Negros, and Cebu, we find a paucity of Mammals, giving one the idea that any land-connection with Mindanao must have been either very ancient or of brief duration; while in the east-central islands Samar, Leite, and Bohol, we meet with several genera in common with Mindanao and Borneo. It is perhaps possible to state with some certainty that the true Philippine group has received no Mammals from Borneo *viâ* Palawan, but several genera from Borneo and perhaps Celebes *viâ* Mindanao, which have been unable to spread further north than Samar; and at that period of migration there was no land-connection with North-west Mindanao and the Negros group. Luzon probably received its peculiar Rodents *viâ* Formosa, and they were unable to spread beyond that island; but at present the highlands of Formosa are a *terra incognita*.

"There are, however, four genera of Mammalia which are dispersed throughout the entire Philippine Archipelago, viz. *Macacus*, *Paradoxurus*, *Viverra*, and *Sus*, all of which are found in Borneo and Palawan, and all of which are carried about by man; for to me it seems impossible to account in any other way for such a general distribution of these four genera, while so many other genera are so strangely and strictly distributed. *Cervus* is also found in many of the Philippines, but its exact distribution is probably unknown, neither have I heard of Palawan as a locality; it is also an animal much carried about by man. *Cervus* and *Sus* are also able, and doubtless do increase their distribution by swimming from island to island; nearly every small island off the coast of the large islands being inhabited by *Sus*. On the top of Monte Data there were small herds of semi-wild pigs belonging to the Igorrotes, and doubtless many must revert to their wild state. Therefore I am much inclined to look upon man as the chief agent in the distribution of the Pig. Deer, of course, are conveyed everywhere and put down with the idea of affording future sport."

*MACACUS CYNOMOLGUS* (Linn.).

*a*, ♂. Barit, Abra Dist., N. Luzon, Nov. 11, 1894.

"The Long-tailed Green Monkey is common throughout the Philippine group. It, as is usual with the various members of this great family, does much harm among the crops planted by man. In North Luzon monkeys infest the forests in the neighbourhood of native plantations, especially those of maize and sweet potatoes; in Samar the rice-fields had to be carefully guarded from their attacks. From the sea-coast to the tops of the mountains the Chongo is ubiquitous. In North Luzon small bands frequented the flat summit of Monte Data, where during the winter months the temperature is as low as 28° Fahr. In Mindoro and Negros we also noticed it at 6000 feet.

"*Distribution*. Found commonly throughout the Philippine Islands, including Palawan.

"Native Tagalo name, 'Chongo.'"—J. W.

*TARSIVS PHILIPPENSIS* Mey.

*Tarsius philippensis* Meyer, Abh. Mus. Dresd. 1894-95, no. 1, p. 1 (1894).

*a*, *b*. Yg. ♂, adult ♀. Samar, June 16, 1896.

Dr. Meyer makes a primary character of the asserted nakedness of the tarsi in the Philippine *Tarsius*, but both these specimens, which may be looked upon as topotypes, instead of having "tarsi denudati" ("vollkommen nackt"), should rather be described, like Dr. Meyer's *T. sangirensis*<sup>1</sup>, as "tarsis fere nudis." The exact differences between the last-named and the Philippine *Tarsius* are not stated by Dr. Meyer when carefully explaining why it is distinct from *T. fuscus*.

<sup>1</sup> Abh. Mus. Dresd. 1896-97, no. 1, p. 9 (1896).

"This remarkable mammal is found in the islands of Samar and Leite, where it is called by the Bisayas 'Magou.' So far as I am aware, it has not been obtained in Luzon or Mindoro to the north, or in Masbate, Cebu, Negros, or Panay, islands to the west and north-west of Samar. It probably occurs in the great island of Mindanao, and perhaps in Bohol, to the south of Leite.

"In habits the 'Magou' is nocturnal, as the enormous owl-like eyes would lead one to suppose; it frequents abandoned clearings, where the new growth has sprung up to a height of some twenty feet, and in Samar, where the ground is also thickly covered with ferns and other plants to a height of some three feet. In such places this little animal easily conceals itself during the day. I had the good fortune to see a 'Magou' in such a locality one day in Samar. The *Tarsius* was clinging to the stem of a small tree just above the fern-growth, with its peculiar hands round the tree; it was awake and intently watching my movements, and permitted me to approach as close as I wished: when, doubtless, at the least sudden movement of my hands it would have jumped to the ground and made off in the thick undergrowth. During the night the 'Magou' is very active, and may often be heard, in localities where they are numerous, uttering a peculiar squeak like a monkey. From its habit of feeding only on insects, this animal has a strong Bat-like smell.

"In Samar, where at different times I kept several 'Magous' alive, I found them very docile and easily managed during the day. They fed freely off grasshoppers, sitting on their haunches on my hand. When offered an insect, the 'Magou' would stare for a short time with its most wonderful eyes, then slowly bend forward and with a sudden dash would seize the insect with both hands and instantly carry it to its mouth, shutting its eyes and screwing up its tiny face in a most whimsical fashion. The grasshopper was then quickly passed through the sharp little teeth, the kicking legs being held with both hands. When the insect was beyond further mischief, the large eyes of the 'Magou' would open, and the legs and wings were then bitten off, while the rest of the body was thoroughly masticated. My captives would also drink fresh milk from a spoon. After the sun had set this little animal became most difficult to manage, escaping when possible, and making tremendous jumps from chair to chair. When on the floor it bounded about like a miniature kangaroo, travelling about the room on its hind legs with the tail stretched out and curved upward, uttering peculiar shrill monkey-like squeaks, and biting quite viciously when the opportunity offered. During the day the pupil of the eye becomes so contracted that it appears only as a fine line, but after dark it is so expanded as to fill up most of the iris.

"The popular native idea is that the 'Magou' feeds on charcoal, the reason for this being that the animal is generally found after the old plantations have been cut down and burnt, the 'Magou' doubtless having returned to its old haunts from



which it had been driven by the woodcutters. This delusion is fatal to all captured 'Magous,' as they are immediately put on a diet of charcoal, and therefore soon starve to death."—J. W.

*PTEROPUS JUBATUS* Eschsch.

*a, b, c.* 3 ad. sk. ♂ ♀. Barit, Abra Dist., N. Luzon, Nov. 1894.

These specimens, practically topotypes of the species, which was described from Manila, have the brilliant golden napes and apparently all the other characters described by Prof. Elliot as diagnostic of his *Pt. auri-nuchalis*<sup>1</sup>. It seems probable, therefore, that this latter name should be considered as a synonym of *Pt. jubatus*, of which the range no doubt extends over the whole of the Philippines.

"This large Fruit-Bat was in immense numbers in the Province of Abra, N. Luzon, where it had taken possession of a long, low range of hills, well covered with forest. Just at sunset these Bats issued from their roosting-place in thousands towards all points of the compass. Numbers of those that passed the Abra river dipped to drink in the stream, but seemed afraid, making often several attempts before they dared to come low enough to touch the water. On the sea-coast also the large Fruit-Bats often dip to drink in the sea on calm evenings. This Bat has a peculiar, though not disagreeable, odour. The wings are quite sticky to the touch. Met with in North-Central Luzon."—J. W.

*PTEROPUS VAMPIRUS* (Linn.).

*a, b.* Verac, Catanduanes Island, Sept. 1894.

This species occurs in every collection made in the Philippines, and is evidently common throughout the archipelago.

"In the island of Samar we obtained several examples, which were unfortunately burnt with my collection on the s.s. 'Weyland.' In Samar this Bat was found roosting during the day in the mangrove-swamps in great numbers.

"My specimens were obtained in the islands of Catanduanes, South Luzon, and Samar."—J. W.

*XANTHARPYIA AMPLEXICAUDATA* (Geoffr.).

*a, b,* ♂ ♀. Highlands of Benguet, Luzon, 5000 feet, Feb. 24, 1894.

These specimens represent Gray's "*Eleutherura philippinensis*," from Manila. Although stated to have been received from Gould, no doubt the type of that form was originally obtained by Cuming.

<sup>1</sup> Field Col. Mus. Publ. vol. i. p. 77 (1896).

## Genus HARPYIONYCTERIS Thos.

*Harpyionycteris* Thos., Ann. Mag. N. H. (6) xviii. p. 243 (1896).

Index with a claw. Wings from the sides of the hairy back, inserted behind at the junction of the first and second toes. No tail. Hind limbs apparently very short. Interfemoral membrane obsolete, buried in thick fur.

Dentition.—I.  $\frac{1}{1 \text{ or } 0}$ , C.  $\frac{1}{1}$ , P.  $\frac{3}{3}$ , M.  $\frac{2}{3} \times 2 = 28$  or 30.

*Teeth* (Plate XXXV. figs. 1–4). Upper incisors large, touching each other and the canines; shaped, when viewed in front, almost like those of *Desmodus*, each with a long oblique cusp touching its fellow in the middle line of the skull, but in section each is broadly triangular, with a broad posterior basal ledge. Canines with a large posterior secondary cusp, about half as high as the main cusp, and with a broad postero-internal basal ledge, but no additional internal cusps; its direction much more slanting forward than usual, as is the lower canine also, so that the two cross each other nearly at right angles, instead of being approximately parallel. First two premolars about as in *Cynopterus*. Molars oblong in section and of a peculiar cuspidate character, the lateral longitudinal walls to the usual median groove broken up into several minute cusps, none of which are at all specially lengthened. Below, the incisors are practically obsolete, being minute and almost crowded out<sup>1</sup> by the large canines, which touch each other in the middle line, and have each an antero-internal and a postero-external secondary cusp and a broad posterior ledge.

It is difficult to say with certainty to what previously known genus this remarkable form is most nearly allied. Its peculiar canines to a certain extent recall those of *Harpyia*, but this resemblance may be either accidental or due to their common descent from the (presumably) cuspidate-toothed ancestors of the Pteropodidæ<sup>2</sup>. On the whole it may be most conveniently placed near *Xantharpyia* and *Boneia*, with which it shares certain external characters, an indical claw, and the check-tooth formula of P.  $\frac{3}{3}$ , M.  $\frac{2}{3}$ ; but the unique incisors, the short bi- and tricuspidate canines, and the multicuspidate molars separate it widely even from these, and render it one of the most isolated of all the genera of the group. Its skull and dentition are figured on Plate XXXV. figs. 1–4.

## HARPYIONYCTERIS WHITEHEADI Thos. (Plate XXX. fig. 1.)

Size about as in *Xantharpyia amplexicaudata*. Fur soft, close and woolly, especially posteriorly. General colour of the fur all over, above and below, a uniform chocolate-brown, a little darker on the face, and a little lighter on the nape and shoulders.

<sup>1</sup> In the single type-specimen one lower incisor only is present, the other having fallen.

<sup>2</sup> See P. Z. S. 1888, p. 473.



Wing-membranes dark, with a few whitish spots scattered about them. Ears of medium length, rounded at their tips. Fur of the back extending thinly on to the forearms, and covering the hind limbs densely down to the roots of the claws. Inter-femoral membrane barely a tenth of an inch wide, wholly buried in the fur.

Dimensions of the type (an adult skin of doubtful sex):—

Forearm 84 millim. (=3·3 inches); head and body 140; ear 17; index-finger and claw 60; third finger, metacarpal 59, first phalanx 44, second phalanx 54.

Skull; basal length 37·5; greatest breadth 23·8; interorbital breadth, tip to tip of postorbital processes, 6·9. Front of canine to back of *m.*<sup>2</sup> 17.

*Hab.* Mindoro, alt. 5000 feet. Dec. 1895.

“This interesting new Fruit-Bat was shot by me in the highlands of Mindoro at an altitude of 5000 feet. It was flying round some high trees at dusk, at which time I generally sat out near my camp on the look-out for nocturnal birds. The specimen, when shot, fell into some tangled undergrowth, and it was only after a careful search with a lamp that my servant found it.

“*Distribution.* Mindoro, 5000 feet.”—J. W.

#### CARPONYCTERIS AUSTRALIS Pet.

*a.* ♀. Negros.

“Obtained a short way up the Canloan volcano.”—J. W.

#### HIPPOSIDERUS DIADEMA Geoffr.

*a.* Manioc, Albay, S.E. Luzon, Aug. 1894.

*b.* Catanduanes, Sept. 24, 1896.

#### PIPISTRELLUS IMBRICATUS (Horsf.).

*a.* ♀. Manila.

A young individual, apparently of this rare species.

“Picked up in a dying state on the side-walk in Manila.”—J. W.

#### MYOTIS MACROTARSUS (Waterh.).

*a.*, ad. al. ♀. Manila, May 20, 1876. Presented by Mr. Whitehead.

This Bat was originally discovered by Cuming, and no other specimen has been received by the British Museum until now. I fail to see, either in the fresh specimen or in the type, that the wing-membrane is attached to the body much nearer to the spine than is usual, a character on which Dobson lays some stress. The black claws of the type, also specially mentioned by him, may have been caused by some fluid in which the specimen had been put, for Mr. Whitehead's fresh specimen, unquestionably identical specifically, has the claws of the normal pale colour.

“Brought to me by some boys in Manila.”—J. W.

## KERIVOULA WHITEHEADI Thos.

*Kerivoula whiteheadi* Thos. Ann. Mag. N. H. (6) xiv. p. 460 (1894).

a. ♂. Molino, Isabella, N.E. Luzon, May 1894. *Type*. Presented by Mr. Whitehead.

Size and proportions about as in *K. hardwickei*, but the ears are slightly longer and the lower legs shorter. Upper surface of wing-membranes to a line drawn from the elbow to the foot, whole of interfemoral membrane except the terminal half-inch, and surface of lower limbs to feet, thinly but distinctly clothed with long orange-coloured hairs, these parts in *K. hardwickei* being practically naked. Forearm, carpus, and index also thinly clothed. Hinder edge of interfemoral with a few short hairs along it, scarcely forming a fringe.

Colour above rufous-orange, the slaty bases to the hairs showing through, below dark slaty, the lighter tips scarcely affecting the general dark tone.

Upper inner incisors slender, with a distinct posterior secondary cusp, to the tip of which the unicuspid outer incisor just reaches. Other teeth apparently as in *K. hardwickei*.

Dimensions of the type (an adult male in alcohol):—

Forearm 32 millim. (= 1.25 inch).

Head and body 39 millim.; tail 39; head 16; ear from notch 13.5; tip to tip of ears across head 28.5; length of index 31.5; third finger (exclusive of cartilaginous tip) 61, fifth finger 47; lower leg 16.2; hind foot without claws 8.

*Hab.* Isabella, N.E. Luzon.

*Type.* B.M. 94. 10. 9. 2.

This species is undoubtedly very close to *K. hardwickei*, but may be distinguished by its hairy interfemoral and by the different structure of its upper incisors. It may be noted that a Mindanao specimen of the older known species shows no approximation to *K. whiteheadi*.

## MINIOPTERUS SCHREIBERSI PUSILLUS Dobs.

a, b. Barit, Abra, Luzon. Presented by Mr. Whitehead.

“Captured in a butterfly-net, while chasing each other round my room.”—J. W.

## GALEOPITHECUS PHILIPPINENSIS Waterh.

a. ♂. Samar, June 10, 1896.

“Fairly common in Samar and Leite, and on the small islands between; I have also seen dozens of skins from the island of Bohol. Several Spaniards do quite a trade in the skins of this Lemur, which are of all shades of brown, grey, and even bright yellow. Generally beautifully mottled, but at times quite unmarked.

“The Flying Lemur passes the day in sleep, clinging to the trunk of some large tree

—and doubtless the coloration of the tree-bark is selected to match the fur by the resting animal, for I have shot in Malacca grey specimens on grey-barked trees.

“The ‘Caguang’ of the Bisayas.”—J. W.

*CROCIDURA* (CROC.) GRAYI Dobs.

*Crocidura* (Croc.) *grayi* Dobs. Ann. Mag. N. H. (6) vi. p. 494 (1890).

*a.* Benguet, Luzon, Feb. 1894. Presented by Mr. Whitehead.

*b.* Monte Data, Feb. 1895.

This Shrew was described by Dr. Dobson from two specimens in the British Museum that had been received from the Zoological Society's old collection, and had been obtained by Mr. H. Cuming. Although merely labelled “Philippines,” they were most probably from Manila.

Luzon also contains a member of the subgenus *Pachyura*, examples of which in the British Museum have been labelled by Dr. Dobson as *C. murina*. Probably they represent Peters's *C. luzoniensis*<sup>1</sup>.

*FELIS MINUTA* Temm.

*a.* Negros.

“This handsome little Cat is apparently found only in the islands of Panay, Negros, and Cebu; but as it also occurs in the great continental island of Borneo, doubtless it will some day be found in Mindanao. One of my hunters declared that he shot at a Wild Cat in Samar among some rough broken-up limestone, into which the wounded animal unfortunately disappeared. I think we may say for certain that this Cat does not occur in Luzon, which is so well cultivated that it could scarcely have escaped detection. In Mindoro it might be possible for this animal to have escaped detection, as the island is perhaps, after Mindanao, the wildest and most densely covered with forest of the whole group.

“In Negros, where we obtained a specimen of *Felis minuta*, the animal frequented the sugar-plantations, where it finds an abundance of rats. During harvesting operations this Cat is often captured by the natives, who form a ring round the last patch of standing cane. One of my collectors said that he saw this animal as high as 6000 feet, on Canloan volcano.

“*Distribution.* Panay, Negros, and Cebu.”—J. W.

*FELIS DOMESTICA* L.

Reference has already been made<sup>2</sup> to what appears to be a feral Domestic Cat obtained by Mr. Whitehead on Monte Data. Mr. Whitehead's own notes on the subject are as follows:—

<sup>1</sup> MB. Ak. Berl. 1870, p. 595.

<sup>2</sup> Ann. Mag. N. H. (6) xviii. p. 245 (1896).



"In North Luzon we obtained a very large specimen of a Wild Cat, on the mountains at an altitude of 7000 feet. This animal, I am told, is a feral race of the Domestic Cat, *Felis domestica*, but it is unlike any Cat that exists in the native villages of to-day, being nearly double the size of any Igorrote Cat, and tabby marked, on a rather sandy ground. My friend Mr. A. H. Everett, however, informs me that he obtained a Wild Cat very like it in Celebes, which turned out to be an offspring of some escaped Domestic Cat."—J. W.

VIVERRA TANGALUNGA Gray.

a. Cape Engaño, N. Luzon, May 17, 1895.

"We met with this beautifully marked Musang at Cape Engaño, the most northern point of East Luzon. One of the specimens obtained is much more clearly marked than the other, and also slightly larger. This Musang was also snared by the natives. In habits it resembles *Paradoxurus*, both being decidedly nocturnal and expert tree-climbers.

"*Distribution.* Found in all the larger islands of the Philippines, including Palawan (Bourus and Worcester)."—J. W.

PARADOXURUS PHILIPPINENSIS Jourd.

a. ♂. La Trinidad, Benguet Dist., N. Luzon, Feb. 8, 1894.

b. ♀. Monte Data, Lepanto, N. Luzon, Feb. 1895.

"Common throughout North Luzon, especially in the high mountains, where melanistic forms seem to occur on an average of one to two with brown ones. The Musang is easily secured by the Igorrote hunter, by setting springes in the narrow mountain pathways, the space on each side of the snare being carefully stopped, forcing a passing animal to walk over the trap, which generally nooses it by one of the fore-paws. In these mountain-paths will be noticed the numerous excreta of this animal, which are often composed of the seeds of small forest fruits; but if a coffee-plantation be in the vicinity the excreta are made up of coffee-stones, the pulpy encasement of the coffee-pip being very sweet. The Musang is, as might be expected, a great enemy to all sorts of poultry, killing simply for amusement after hunger has been satisfied. Met with in North Luzon from the coast up to 8000 feet.

"*Distribution.* Found in all the larger islands of the Philippines, including Palawan."—J. W.

SCIURUS SAMARENSIS Steere.

a. Samar, June 6, 1896.

The figure given by Dr. Meyer<sup>1</sup> of this species is evidently very much over-coloured,

<sup>1</sup> Abh. Mus. Dresd. 1896-97, no. 6. p. 29, pl. xi. fig. 2 (1896).

as neither Mr. Whitehead's specimen nor one of Steere's co-types in the British Museum has feet anything like so strikingly black as is there shown.

The British Museum possesses examples of three species of middle-sized Squirrels from the Philippines—*S. steerei* Günth., of Palawan and Balabac, *S. philippinensis* Waterh., of which, besides the much-deteriorated type from "Mindanao," Mr. Everett has sent examples from Zamboanga and Basilan, and *S. samarensis* Steere, of Samar. Whether, as the localities would indicate, *S. mindanensis* Steere (*S. cagsi*, Mey.) is synonymous with *S. philippinensis*, or is most closely allied to *S. samarensis*, I am not at present able to determine.

"Met with both in Samar and Leite, but by no means common, being difficult to see or shoot owing to the great height of the forest trees in these islands.

"The 'Alalaksing' of the Bisayas."—J. W.

*NANNOSCIURUS SAMARICUS* sp. n.<sup>1</sup> (Plate XXX. fig. 2.)

*a.* ♀. Samar, June 30, 1896. *Type.*

Allied to *N. concinnus* Thos., but greyer and less rufous. Two premolars present in the adult.

Size and general characters very much as in *N. concinnus*. Fur, however, much shorter and more velvet-like, the hairs about 5 millim. long on the back. General colour of head and body finely grizzled olive-grey, with only a faint tinge of rufous on the back, thus contrasting with the broadly rufous-washed *N. concinnus*. Under surface rather thinly haired, dirty greyish, not defined on the sides. Limbs dusky, upper sides of hands and feet dusky grizzled grey, a few orange-tipped hairs on the digits. Characters of sole-pads apparently much as in *N. concinnus*. Tail similar to that of the allied species, but the rufous rings on the hairs are less developed, and the black ones more, so that the general result is darker.

Skull apparently very similar to that of the allied species, but the nasals are somewhat narrower.

Two upper premolars present, the anterior minute, styliform, circular, the posterior considerably larger, but still much smaller than *m*.<sup>1</sup>. Molars all much more rounded than in *N. concinnus*, their transverse scarcely exceeding their longitudinal diameter.

Dimensions of the type, an adult female, in skin:—

Head and body 88 millim.; tail, without hair 69, with hair 94; hind foot (moistened) 25·2.

Skull: greatest breadth 16·2; nasals, length 7·7, breadth 3·1; interorbital breadth 10; tip to tip of postorbital processes 12·6; diastema 6; length of cheek, with series (*p*.<sup>4</sup> to *m*.<sup>3</sup>) 4·1, of three molars only 3·0. Lower jaw: condyle to incisor tip 18·2; bone only 15·5.

<sup>1</sup> See preliminary diagnosis in Minutes of P. Z. S. for June 15, 1897 (published June 19).

This little Squirrel is perhaps merely the representative of *N. concinnus* in Samar, as it seems probable that there are really two premolars in that animal as in the other Malayan *Nannosciuri*. The original specimen was described by me as having only one premolar; but this latter proves on further examination<sup>1</sup> to be the milk-premolar, a fact which renders it rather uncertain whether the adult may not have the additional anterior premolar generally present.

Apart from this question, *N. samaricus* may be readily distinguished from *N. concinnus* by its longer fur, much more rufous coloration, and rounder molars.

"Like the last species, but less often observed."—J. W.

#### CELÆNOMYS, g. n.<sup>2</sup>

Colour normal. External form as in *Chrotomys*.

*Skull* (Pl. XXXV. fig. 12) broad and strong, evenly rounded, without ridges, very wedge-shaped in lateral view, owing to the great height of the brain-case, and the uniform way in which the fronto-nasal and palatal profiles approach each other anteriorly. Nasals short, not overhanging the incisors. Brain-case smooth and rounded. Interparietal strap-like, fairly well developed. Anteorbital foramen little expanded above, the front edge of its outer plate vertical, not produced forward. Palatal foramina very small. A distinct incisive fissure<sup>3</sup> present, nearly half the size of one of the palatal foramina. Posterior nares broad. Lower edge of mandible peculiarly flattened just behind the symphysis, and pierced with a large number of minute foramina. Coronoid processes long, strongly curved backward.

*Teeth*. Incisors much thrown forward, simple, rounded and bevelled in front in a manner similar to that found in *Lophuromys*. Molars  $\frac{2}{2}$  (Pl. XXXV. fig. 11), in essential structure like the anterior two of *Chrotomys* (see below), but the ridges and crests less sharp, although this may be (indeed probably is) due to wear, a point which cannot be settled until young examples are examined. No trace of a third molar either above or below.

Type. *C. silaceus* Thos.

This genus, although it has the same reduced number of teeth as *Hydromys* and *Xeromys*, is no doubt really most closely allied to *Chrotomys*, to which, both in external form and in the general shape of the skull, it presents considerable resemblance. Still, besides the absence of *m.*<sup>3</sup>, it may be distinguished by its normal coloration, longer and narrower brain-case, and larger interparietal.

<sup>1</sup> Cf. Forsyth-Major, P. Z. S. 1893, pl. xi. fig. 7.

<sup>2</sup> κελευός, dark-coloured; in contradistinction to *Chrotomys*, derived from χρώς, colour, in allusion to the striking coloration of *Chrotomys whiteheadi*.

<sup>3</sup> By this term I refer to a small mesial opening present, in a great many different forms, between the two premaxillæ, just behind the incisors.



The suppression of  $m.^3$  in *Celenomys* is an interesting sign of its relationship to the Australian members of the subfamily, *Hydromys* and *Xeromys*, both of which have only two molars, while the other two Philippine genera, *Chrotomys* and *Crunomys*, have the normal Murine number of three molars.

*CELENOMYS SILACEUS* (Thos.) (Plate XXXI. fig. 1.)

*Xeromys* (?) *silaceus* Thos. Ann. Mag. N. H. (6) xvi. p. 161 (1895).

*a, b.* Monte Data, Feb. 1895.

Size of a common Rat. Fur soft, close and velvety, hairs on posterior back about 10–12 millim. in length. General colour uniform slaty grey, very finely grizzled with whitish, but so finely as scarcely to affect the general grey tone. Sides of muzzle nearly black. Under surface rather paler than the back, not sharply defined, the hairs slaty grey basally, washed with buffy white terminally. Eyes small, not black-ringed. Ears short, uniform greyish. Hands and feet as far as the metapodials dark grey, the digits whitish or flesh-coloured. Tail rather shorter than the body without the head, thinly haired, brown above basally, whitish below and at the tip.

Skull as already described.

Dimensions of the type (♂) taken in skin:—

Head and body (probably rather stretched) 195 millim.; tail 110; hind foot (moistened) 33·4.

Skull, see p. 395.

*Hab.* Monte Data, Lepanto, N. Luzon, 8000 feet.

“This curious Mammal at first sight might easily be confounded with *Rhynchomys soricoides*, and, like that animal, was also obtained on the table-topped summit of Monte Data. It seems rare, only two specimens having been snared in some five weeks. The skull and teeth, instead of being frail as in *Rhynchomys*, are powerful, and much more nearly allied to *Chrotomys*. The eye is small as in *Rhynchomys*, and the outward appearance quite as Shrew-like. The habits of this peculiar Mammal I am quite unable even to guess at.

“*Distribution.* High mountains of Central Northern Luzon.”—J. W.

CHROTOMYS.

*Chrotomys* Thos. Ann. Mag. N. H. (6) xvi. (1895) p. 161.

Colour abnormal among Muridæ, the back prominently striped. Form suited for a terrestrial, not aquatic life. Size about as in the common Rat. Fur soft and straight. Muzzle apparently not cleft. Eyes rather small. Ears well developed. Tail rather short, thinly haired, scaly. Pollex with a rounded nail; other digits, including hallux, with well-developed, little-curved claws.

*Skull* (Pl. XXXV. fig. 9) in general form not unlike that of *Celanomys*, but even more wedge-shaped owing to its greater height posteriorly. Nasals short, their anterior end level with the middle of the incisive fissure. Interorbital region similarly rounded and unridged. Brain-case broader and shorter, so that its breadth is equal to its length. Interparietal very small, a mere narrow transverse slip. Anterior edge of zygoma-plate slightly concave, the plate little developed. Incisive fissure large, quite half as large as one of the palatal foramina, which are, as usual in this group, very small. Posterior nares large and open, the hinder edge of the palate level with the posterior lamina of  $m.^2$ . Pterygoids large, projecting downward considerably below the level either of the molars or bullæ. Lower jaw as in *Celanomys*.

*Teeth*. Incisors pale yellow, thrown forward, simple, rounded in front. Molars  $\frac{3}{2}$  (Pl. XXXV. fig. 8), the anterior two very similar in structure to those of *Xeromys* (figured P. Z. S. 1889, pl. xxix. fig. 10), but  $m.^1$  has its middle lamina simpler (more as in *Hydromys*) and its posterior lamina is almost obsolete, while  $m.^2$  has its posterior supplementary cusp more definitely postero-external, the difference in position being no doubt due to the presence of the additional molar behind.  $M.^3$  quite small, transversely or obliquely oval in section. In size  $m.^2$  and  $m.^3$  together are barely two thirds the length of  $m.^1$ .

Below,  $m.^1$  is of the most ultra-hydromyine character, without any of the suppressed cuspidation of the anterior margin found in *Xeromys*, and even without the supplementary postero-external cusp found in both the Australian genera.  $M.^2$  as in *Xeromys*.  $M.^3$  nearly circular, about one-sixth the size of  $m.^2$ , slightly larger than  $m.^3$ .

#### CHROMOMYS WHITEHEAD! Thos. (Plate XXXII.)

*a-d.* Monte Data, Lepanto, 8000 feet, Feb. 1895.

*Size of Mus rattus*. Fur soft and thick, but not specially long. General colour greyish brown, tending in some specimens to rufous; a well-defined buff or orange line extending from between the eyes down the back nearly to the tail, shown up on each side by a broad shining black band. Under surface dull slaty buff, not sharply defined on the sides. Top of muzzle dark brown, continuous with the dark edgings to the central yellow band. Ears of medium length, fairly covered with minute hairs, uniformly blackish brown. Metapodials shining grey, digits nearly naked, whitish. Tail short, slender, about half the length of the head and body, thinly hairy, brownish black above, rather paler below, extreme tip whitish.

Skull and teeth as already described.

Dimensions of the type, an adult male, measured in skin:—

Head and body 196 millim.; tail 111; hind foot (moistened) 35.

Dimensions of skull, see p. 395.

*Type*. B.M. 95. S. 2. 19.

Owing to the remarkable modification in its colour, quite unique among Muridæ, this animal may be looked upon as one of the most striking of all Mr. Whitehead's discoveries. Scientifically, it shares with *Celonomys* and *Crunomys* the interest attaching to the occurrence of the subfamily Hydromyinae away from the Australian region, to which the only two previously known genera are confined. No member of the group has as yet been found in any of the intervening islands, although it is possible that when the higher mountains of the archipelago are more thoroughly explored other forms referable to the subfamily will also be found to occur there.

"This handsome Rat was obtained on the summit of Monte Data. It is said by the natives to feed on sweet potatoes and grass, and to frequent the neighbourhood of their plantations. *Chrotomys* is also met with at almost the sea-level, as I saw in Manila a specimen obtained in the Forest of Tarlae in Central Luzon to the north of that city.

"*Distribution.* Probably throughout Luzon."—J. W.

#### CRUNOMYS<sup>1</sup>, g. n.

External characters, apparently much as in *Xeromys*, though the number of mammae and sole-pads cannot at present be determined. Fur thickly mingled with spines. Ears short and rounded. Hallux with a claw. Tail rather short, thinly haired, apparently flattened at end, but this appearance may be simply due to contraction in drying.

*Skull* (Pl. XXXV. fig. 6) with the peculiar shape characteristic of many Water-Rodents, such as *Hydromys*, *Ichthyomys*, and others; low, flattened, its frontal profile *concave*. Nasals long, overhanging the incisors in front. Interorbital region broad, its edges with scarcely a trace of beading. Interparietal large. General shape of anteorbital foramina almost exactly as in *Chrotomys*, the outer plate not produced forward. Incisive fissure minute. Anterior palatine foramina short. Posterior edge of palate just level with the hinder edge of *m*.<sup>3</sup>.

*Molars* (Pl. XXXV. fig. 5) much worn in the only specimen, so that it is difficult to make out their exact structure. It is, however, clear that they are more murine in structure than is the case with the other members of the Hydromyinae; in *m*.<sup>1</sup> the anterior lamina is oblique just as in the other genera of the Hydromyinae, but in other respects might almost be that of *Mus* itself. *M*.<sup>2</sup> is also very murine, having a small antero-internal cusp, a long middle lamina, and a mesial circular one posteriorly; *m*.<sup>3</sup> is subcircular, with a small antero-internal cusp. Below, on the other hand, the teeth are not unlike those of *Chrotomys*, except that *m*.<sup>3</sup> is bilaminar as in *Mus*, a difference that one would expect to occur owing to the greater development of this tooth in *Crunomys*.

Type. *Crunomys fallax*.

This genus is most interesting from an evolutionary point of view, for it adds

<sup>1</sup> κρουνός, a well-spring; κρουνίαι, torrents or streams.



another to the links that connect the aberrant *Hydromys* with the true Murinæ, and is indeed the last link needed. For we may take five main characters as distinguishing *Hydromys* from an ordinary *Mus*, viz.: (1) aquatic form; (2) flattened skull; (3) reduced plate to zygoma-root; (4) two molars only; and (5) peculiar molar structure. The first discovered linking genus, *Xeromys*, was murine as to 1, 2, and 3, hydromyine as to 4 and 5; then came *Chrotomys*, murine as to 1, 2, and 4, hydromyine as to 3 and 5. *Celanomys*, described above, is like *Chrotomys*, but also hydromyine as to 4; and now comes *Crunomys*, murine as to 1, 4, and to a certain extent the highly important 5 (molar structure), but with the hydromyine 2 and 3, in addition to the short palatal foramina found in all the genera mentioned.

Like all annectant genera, *Crunomys* is most difficult to place satisfactorily in the system, and it is only with much hesitation that I have included it in the Hydromyinae, a position which will have to be revised when specimens showing the unworn dentition, the mammary formula, and other characters are available for examination.

The following is a rough synopsis of the genera now considered to belong to the Hydromyinae<sup>1</sup>:—

Molars  $\frac{2}{2}$ .

- |  |                       |
|--|-----------------------|
| Aquatic. Skull flattened; frontal profile concave . . . . .            | 1. <i>Hydromys</i> .  |
| Terrestrial. Skull rounded; frontal profile normal . . . . .           |                       |
| Outer wall of anteorbital foramen slightly projected forward . . . . . | 2. <i>Xeromys</i> .   |
| Outer wall of anteorbital foramen not projected forward . . . . .      | 3. <i>Celanomys</i> . |

Molars  $\frac{3}{3}$ .

- |  |                         |
|--|-------------------------|
| Molars strictly hydromyine in structure. Back striped. Fur soft. . . . . | } 4. <i>Chrotomys</i> . |
| Terrestrial, fossorial . . . . .   |                         |
| Molars more murine. Back unstriped. Fur spiny. Semi-aquatic . . . . .    | 5. <i>Crunomys</i> .    |

The first two are Australian, the last three Philippine.

*CRUNOMYS FALLAX*, sp. n.<sup>2</sup> (Plate XXXIII. fig. 1.)

Size about as in *Xeromys myoides*. Fur short and close, profusely mixed with flattened spines; neither hairs nor spines longer than about 6 mm. on the back. General colour pale greyish, lined with yellowish on the back. Dorsal spines white, darkening to black at their tips. Belly dirty greyish white, not sharply defined, the hairs slaty basally, dull whitish terminally. Sides of muzzle brown. Whiskers numerous, long, mixed black and white. Ears short, uniformly brown. Hands and feet greyish brown on the metapodials, lightening to white on the digits; fifth hind toe

<sup>1</sup> Since this paper was read an additional genus, *Leptomys*, has been described from New Guinea (Ann. Mus. Genov. (2) xviii. 1897). It has  $\frac{3}{3}$  molars, like *Chrotomys* and *Crunomys*.

<sup>2</sup> See preliminary diagnosis in Minutes of P. Z. S. for June 15, 1897 (published June 19).

reaching to the end of the 1st phalanx of the fourth. Tail about the length of the body without the head, uniformly short-haired, black, rather lighter along the middle of its under surface.

*Skull-dimensions (in millim.) of Rhynchomys and Hydromyinae, all from type specimens.<sup>1</sup>*

	<i>Rhynchomys</i> <i>soricoides</i> . ♂.	<i>Celenomys</i> <i>silaceus</i> . ♂.	<i>Chrotomys</i> <i>whiteheadi</i> . ♂.	<i>Cranomys</i> <i>fallax</i> .
Basal length .....	44	34	37.5	(Lambda to nasal tip
Basilar length .....	41.5	31.7	35	20.5.)
Greatest breadth .....	19.5	19	21	(c.) 12.1
Nasals, length .....	20	12	13.2	9.2
„ breadth .....	3.8	3.3	4.1	2.8
Interorbital breadth .....	6.9	6.9	6.8	4.6
Interparietal, length .....	3.2	2.8	2.2	—
„ breadth .....	10.5	8.6	7.5	9.1
Length of anterior zygoma-root .....	2.5	3.6	2.9	1.7
Palate, length from hensenion .....	24.5	17.1	20	11
Diastema .....	16.8	13.1	15.2	7.2
Anterior palatine foramina, length .....	6.5	3.5	4.4	3.5
„ „ breadth .....	2.1	1.6	2.1	1.5
Length of upper molar series .....	—	—	5.2	3.6
„ <i>m</i> . <sup>1</sup> and <i>m</i> . <sup>2</sup> combined .....	2.5	3.8	4.8	3.2
Lower jaw, condyle to incisor-tip .....	34	—	31.2	16.5
„ bone only .....	30	21.5	25.1	13.7
„ height, coronoid to angle .....	9.7	10	11.1	—
„ „ ramus below <i>m</i> . <sub>1</sub> .....	3.3	4	5	3.1

Skull as already described.

Dimensions of the type, measured in skin, and all merely approximate:—

Head and body 105 millim.; tail 79; hind foot 23; ear 10.

Skull, see above.

*Hab.* Isabella, Central N. Luzon. Alt. 1000 feet. Coll. May 1894.

*Type.* B.M. 97. 4. S. 4. Presented by Mr. Whitehead.

This little animal might readily be, and indeed for some time was, taken for a species

<sup>1</sup> A few of these measurements differ to a minute extent from those previously published, these latter having been taken before the skulls were perfectly cleaned. The present measurements may be considered as the more correct.

of *Mus* allied to the group of *M. ephippium*, of which specimens are often found with more or less spinous fur. Mr. Whitehead, however, from the character of the place where he took it, thought it would prove to be a peculiar form, and his opinion has been most fully confirmed by an examination of its skull.

The following are Mr. Whitehead's notes on its capture :—

"In one of my wanderings through the parched-up forests of Isabella (in North-Central Luzon) I noticed a small red kingfisher (*Ceyx melanura*) fly into the scrub near a small stream. Having only a large gun with me, I sent my servant back to the village for a small collecting-gun. While seated beside the stream, a small mouse was observed among some large stones on the opposite side, busily searching after food. I opened one of my 16-bore cartridges and picked out all the shot (No. 6) but four or five pellets, and luckily killed the small animal without much damage being done. Being sure, from its peculiar habits, that it must be something interesting, I carefully skinned it and sent it home, and am now rewarded by the addition of another new generic form to this already interesting collection."

#### RYNCHOMYS Thos.

*Rhynchomys* Thos. Ann. Mag. N. H. (6) xvi. p. 160 (1895).

Form rather Shrew-like. Muzzle enormously elongate. Feet normally murine, pollex with a broad nail. Tail Rat-like, scaly, thinly haired.

*Skull* (Pl. XXXV. fig. 10) of very peculiar shape, the brain-case broad, smooth and rounded, and the muzzle narrow and much elongated. Nasals long and narrow, terminating behind at the same level as the premaxillæ; viewed in profile they show a curious rise at their anterior extremity, the general frontal profile being practically an even slope from the crown to a point at the end of the anterior third of the nasals, and then bending upward again, as shown in the figure. Interorbital region smooth, evenly rounded, quite unridged. Interparietal large, transversely oblong, unusually variable as to its exact shape. Anteorbital foramen typically murine in essentials, but its outer wall very narrow and much slanted backward, so that the anterior edge of the upper root—the bridge—is actually posterior to the hinder edge of the lower root. In these respects it recalls the S. American *Oxymycterus*. Zygomata slender, low, and little sloped vertically. Palate long and narrow; a distinct incisive fissure present; palatal foramen of normal size, but comparatively far forward in the skull, so that their posterior end is nearly their full length in front of the molars. On each side, just in front of *m*.<sup>1</sup>, there is a distinct raised ridge about a couple of millimetres long, and there is a somewhat similar ridge behind the last molar in the lower jaw; these ridges are very possibly used to supplement the minute teeth in eating. Posterior bony palate broad and produced far back; posterior nares rather narrow; internal



pterygoid processes large, triangular, projecting far downward, in fact below the level of the tips of the incisors; external processes practically or quite obsolete, so that there are in this animal no enclosed pterygoid fossæ. Bullæ small, but not of abnormal structure.

Lower jaw exceedingly low, slender, and little curved. Coronoid processes very fine, slanted backwards.

*Teeth* (Pl. XXXV. fig. 7) extraordinarily reduced, the dental armature in *Rhynchomys* being less in proportion to the size of the animal than in any other Rodent, perhaps even—apart from the Cetacea—than in any other toothed mammal. Incisors white above, pale yellow below; the upper ones not grooved, very short, narrow, slender, and forming the arc of a very small circle, so that their roots come opposite the anterior end of the palatal foramina, and the chord of the circle they describe is barely more than a third of the diastema. Molars  $\frac{2}{3}$ , so minute that it is difficult to understand of what use they can be to the animal; *m*.<sup>1</sup> oval, flat-crowned, or with low indistinct cusps, but without quite young specimens it is impossible to make out for certain whether there is any true cuspidate structure; *m*.<sup>2</sup> about half the size of *m*.<sup>1</sup> and a shorter oval in outline.

Lower incisors very slender, and, owing to the oblique set of their enamel-covered faces, they wear to an unusually fine point, as sharp as a needle. Lower molars very similar both in size and shape to those of the upper jaw. In one specimen the posterior lower tooth is altogether absent on both sides, so that there is only one molar present; this fact shows strikingly the tendency there is to a progressive reduction of the molar teeth.

Type. *Rhynchomys soricoides*.

This most remarkable genus, by its peculiar Shrew-like appearance, reduced teeth, elongate muzzle, and other characters, seems at first sight perfectly isolated from any other known group, and in my recent classification of Rodents it was made the type of a subfamily of the Muridæ, the Rhynchomyinæ<sup>1</sup>. But among the Rodents then included in the Murinæ—on account of its strictly murine molars—there occurs the genus *Echiothrix*<sup>2</sup>, a native of Celebes, which also has an elongated snout. This animal, of which the Museum now possesses two perfect specimens from N. Celebes,

<sup>1</sup> P. Z. S. 1896, p. 1017.

<sup>2</sup> Described by Gray, P. Z. S. 1867, its correct locality determined by Jentink, Notes Leyd. Mus. v. p. 177 (1883); renamed by me *Craurothrix*, Ann. & Mag. N. H. [6] xviii. p. 246 (1896). As I have now joined those who think that names should be retained as originally spelt, whether classically right or wrong (except in the case of obvious misprints), I am now prepared to consider that Peters's *Echiothrix* of 1853 does not preoccupy Gray's *Echiothrix* of 1867, and therefore again recognize the latter term. Those who are not of this opinion must call it *Craurothrix*. That the missing out of the letter *n* is not a misprint is shown by Gray having written on the type skin what appears to be "*Echithrix*," might be "*Echiothrix*," but is certainly not "*Echinothrix*."

collected by Mr. Charles Hose, I have carefully compared with *Rhynchomys*, and have come to the conclusion that, in spite of the absence of any tendency towards a reduction in the dentition, there is a genuine relationship between the two forms. In the Celebean animal the general shape of the skull is very similar to that found in *Rhynchomys*: the peculiar anterior nasal bulging is present; the brain-case is similarly smooth and rounded; the supraorbital and temporal ridges, although present, are very small; the zygomatic root is slightly slanted back; and the posterior palatal region is strikingly similar to that of *Rhynchomys* both in the breadth and shape of the posterior nares, and the entire suppression of the external pterygoids. The incisors again—or at least the upper ones<sup>1</sup>—in size, proportions, and position are more like those of *Rhynchomys* than of ordinary murines.

On the other hand, the molars of *Echiothrix* are absolutely murine, and show no trace of reduction or any other peculiarity. The third molar is, of course, present above and below, and is of full murine proportions.

On the whole it seems probable that we have in *Echiothrix* a form which bears to *Rhynchomys* very much the relation that *Crunomys* does to *Hydromys*, being, as in that case, the first commencement of a line of modification which culminates in a genus sufficiently distinct to demand subfamily separation from the main trunk of the Murinæ. If this be true, it would then probably be best to include all the members of the diverging branch within the special subfamily, even if nearer to the trunk than to the extremity, and I would therefore suggest, as in the case of *Crunomys*, that *Echiothrix* should be transferred to the Rhynchomyinæ, a name which would be particularly suitable owing to the long snout being the most obvious character that the two genera have in common.

It is, of course, just possible that when unworn teeth of *Rhynchomys* are examined they will show a structure quite incompatible with the view that this form is related to *Echiothrix*, but it seems to me that the many cranial characters which the two forms have in common render this possibility very unlikely.

#### RHYNCHOMYS SORICOIDES Thos. (Plate XXXI. fig. 2.)

Size of a common Rat. Fur thick, close, and velvety, about 14 or 15 millim. long on the back. General colour dark olivaceous grey, becoming more yellowish in old age. Under surface dirty grey, not sharply defined, but becoming lighter and more sharply defined in old examples; a white patch sometimes present on the throat or chest.

<sup>1</sup> The lower incisors of *Echiothrix* are perfectly unique in being widely separated from each other terminally, so that, being also very long, their tips bite up on each side of the upper incisors, which project down between them. How far up they actually go in life on the sides of the muzzle cannot be determined without the examination of fresh or spirit specimens, but their splay is sufficient for the whole muzzle to close down between them.

Sides of snout obscure whitish, top blackish. Eyes small, not noticeably ringed. Ears rather large, thinly haired, the anterior half of their outer and posterior half of their inner surfaces blackish. Wrists and metacarpals brown above, digits whitish or flesh-coloured. Hind feet similarly coloured. Tail shorter than head and body, very finely ringed, clothed with short hairs, not pencilled terminally, blackish above, scarcely paler below, the extreme tip white in most specimens.

Skull and teeth as above described.

Dimensions of the type, measured in skin (♂):—

Head and body 215 millim.; tail 146; hind foot (moistened) 41.

Skull, see p. 395.

*Hab.* Monte Data, 8000 feet.

The following are Mr. Whitehead's notes on this most peculiar animal. It is unfortunate that he has no positive knowledge of its habits or food, as its anomalous dentition is certain to be correlated with some food very unusual among Muridæ; very possibly, as Mr. Whitehead suggests, it eats caterpillars or worms, for it is difficult to imagine any vegetable food for which its reduced dentition and Shrew-like snout would be at all suitable:—

“This interesting Shrew-Rat was obtained on the summit of Monte Data, where only five specimens were snared. I am unfortunately unable to give any account of the habits of this extraordinary mammal. The Igorrotes told me that it lives on grass, which is probably untrue, the teeth apparently being quite unfitted for such food; insects and worms are probably the diet suited to such rudimentary molars. The eye is, comparatively speaking, small, which leads me to believe that *Rhynchomys* is a diurnal-feeding Rat, like the true Shrews.

“*Distribution.* High mountains of Central Northern Luzon.”

PHILOMYS PALLIDUS Nehring.

*a.* ♂. La Trinidad, Benguet Dist., N. Luzon, Feb. 9, 1894.

*b, c.* ♂ ♀. Cape Engaño, Lepanto, N. Luzon, May 1895.

*d.* Monte Data, Luzon, Feb. 1895.

The specimens sent by Mr. Whitehead all belong to the larger soft-haired form to which Dr. Nehring applied the name of *P. cumingi*, var. *pallidus*, but which appears to me to be sufficiently distinct to demand specific recognition.

When Dr. Nehring first suggested the name, Dr. Meyer considered him wrong in doing so, and, with some whitish and piebald specimens before him, quoted a letter of mine, informing him that the original series of *P. cumingi* also contained both black and piebald specimens, and that therefore the species was to be regarded merely as a very variable one. On now looking again at the original specimens in the Museum collection, I find, to my surprise, that there is among them a bad, but perfectly



typical, specimen of *P. pallidus*, received from Mr. Cuming in 1853, some time after Mr. Waterhouse described *P. cumingi*, of which it was noted at the time to be a "variety." This specimen is, of course, that referred to in my letter to Dr. Meyer, it not having been up till now distinguished from the typical dark-coloured *P. cumingi*.

*P. pallidus* differs from *P. cumingi* in its larger size, longer and much softer fur, and paler colour. It is, however, very variable in colour, as has been described by Dr. Meyer on his specimens, and as those of Mr. Whitehead confirm. One of the latter even has no dark saddle-mark, a characteristic that seems to be nearly invariably present. In the skulls also there is an astonishing degree of variability in the size and shape of the interparietal bone, a variability I have never seen equalled elsewhere. But I have quite failed to divide the forms into two or more races, as the characters drawn from the interparietal run altogether at cross purposes to those drawn from the external ones.

"This splendid Rodent, larger and more powerful even than *Crateromys schadenbergi*, is, on the high mountains of North-west Luzon, much rarer than that species. In six months I obtained only four specimens, all of which were captured by the Igorrotes, aided by their dogs. This Rat, they told me, lived in old tree-trunks, and one specimen was slightly singed, having been smoked out of a hole in an old tree. The *Phlæomys* is also found on the coast-level, two of my specimens having been shot at Cape Engaño as they were ascending trees in the early morning. The Engaño pair have much shorter fur and are browner underneath than those obtained in the higher altitudes, but still show the same black markings on face and shoulders; two of the highland specimens are without black markings, but are undersized and probably immature. It is possible that *Phlæomys pallidus* is a grey variety of *P. cumingi*, which is a brown-coloured animal, as we find three distinct varieties of *C. schadenbergi*.

"A grey *Phlæomys* occurs in the island of Marinduque to the S.W. of Luzon. The specimen I saw was in a kerosene-oil tin on a steamer in which I was a passenger. This animal had a white face like those just mentioned from Lepanto.

"*Distribution.* Luzon and Marinduque.

"Igorrote name, 'Eüt-eüt.'"—J. W.

MUS EVERETTI Günth.

a-c. ♂ ♀. Monte Data, 7500 feet, Feb. 1895.

This fine Rat was hitherto known only from a single specimen, the type, now in the British Museum, and Mr. Whitehead's beautiful skins are therefore particularly acceptable.

"Much commoner than the next species, which is found in the same locality."—J. W.

## MUS LUZONICUS THOS.

*Mus luzonicus* Thos. Ann. Mag. N. H. (6) xvi. p. 163 (1895).

*a, b.* ♀. Monte Data, Lepanto, Luzon, 8000 feet, Feb. 1895. *a*, type.

*c.* Yg. al. Lepanto Highlands, Luzon. Presented by Mr. Whitehead.

Allied to, and of about the same size and dorsal colour as, the last species. Fur much longer and softer, the wool-hairs about 20 millim. long on the back, and the longer hairs from 30 to 40. General colour coarsely grizzled brown, resulting from a mixture of buffy yellow and black; the wool-hairs dark slaty basally, their tips for 4 or 5 millim. buff, the long hairs black, but some of them with their extreme tips whitish. Under surface dull slaty buff, not defined on the sides; the hairs slaty basally, buff terminally. Head clearer greyish, owing to the tips of the shorter hairs being rather whitish than yellow. Eyes with an indistinct blackish ring, most marked posteriorly above. Ears of medium length, very thinly haired, their backs blackish, finely edged with white. Upper surface of hands and feet hoary, some of the hairs blackish, and others (the majority) silvery white. Tail rather shorter than in *Mus everetti*, well haired, though not pencilled, coarsely scaled (scales 8 or 9 to the cm.), its proximal half or two-thirds black above, paler below, its distal portion white all round.

*Skull* (Pl. XXXVI. fig. 4) markedly distinguished from that of *M. everetti*, and perhaps from all other Rats of so great a size, by the reduction of the supraorbital ridges, which merely form a fine beading along the edges of the frontal, and practically disappear halfway along the parietals. Brain-case smooth, round, and swollen; and this character is present all over the skull, which is unusually smooth and without ridges and angles. Posterior nares broad and open, the palatal edge opposite the hinder margin of *m*.<sup>3</sup> Bullæ smaller than in *M. everetti*.

Incisors yellow, not the dark orange of *M. everetti*. Molars broader than in that animal, the laminae more simply transverse, and the outer cusp of each lamina less distinctly defined from the middle cusp.

Dimensions of type (♀) measured in skin:—

Head and body 240 millim.; tail imperfect (of another specimen 200); hind foot (moistened) 47.

Dimensions of skull of type, see p. 404. Another specimen has a basilar length of 44 millim. by a greatest breadth of 28·6.

*Hab.* Monte Data, Luzon.

“Scarce on Monte Data, where only four specimens were obtained.”—J. W.

It is curious that two large Rats of the group with white-tipped tails should inhabit the Data plateau; but, like as they are in size and colour, there can be no question that they are of perfectly distinct species.

*MUS DECUMANUS* Pall., var.

a. Monte Data, Luzon, Feb. 1895.

This is a Rat so similar to some of the forms of *Mus decumanus* that, like the *Felis domestica* above referred to, I can only suppose it to be the slightly modified descendant of introduced examples.

*MUS RATTUS* L., var.

a. ♀. Negros, 6500 feet.

b. ♂. Mindoro, coast-level, Dec. 1895.

The single specimen of the *Mus rattus* group from Negros seems sufficiently like the Bornean variety to be provisionally referred to it. In many ways it has more the aspect of some of the Indian forms of the species, such as *M. rattus rufescens*, than any other Philippine or Bornean Rat that I have seen.

A coast-level example from Mindoro may also be placed here. Its differences from the highland *Mus mindorensis* are very striking.

*MUS MINDORENSIS* sp. n.<sup>1</sup>

a-e. 5 sks. Monte Dulangan, Mindoro, 5000 feet, Dec. 1895.

A Rat of the group of *Mus rattus*, apparently forming a peculiar insular race.

Size of *Mus rattus* or rather smaller. Fur straight, sleek, and shining. General colour very dark as compared with the ordinary eastern forms of the group, *Mus neglectus*, &c.; back a dark finely grizzled brown, the grizzling much finer than usual. The light colour in the grizzling is a deep orange, becoming rather more yellowish on the sides. Under surface whitish or dirty slaty grey, not defined from the upper colour, and not unlike in tone that of typical house-haunting specimens of *Mus musculus*. Face uniformly dark like the body, hairs round base of ears behind nearly black. Ears rather short, almost naked, the hairs so minute that a lens is needed to see them at all. Hands and feet blackish above, the digits scarcely paler. Tail decidedly shorter than the head and body, smooth, very thinly haired, almost naked, finely scaled (about 10 rings to the cm.), uniformly black above and below.

Skull very uniform in character throughout the series. Brain-case rounded, swollen. Supraorbital edges with the usual ridges rather weakly developed, and scarcely to be distinguished on the posterior half of the parietals. Interparietal large, its anterior edge slightly curved forward. Palatal foramina large and well open, reaching posteriorly just to the level of the front edge of the anterior root of *m*.<sup>1</sup>. Posterior edge of palate broad, squarish. Bullæ rather smaller than in typical *Mus rattus*.

Dimensions of the type, an adult male in skin:—

Head and body 190 millim.; tail 163; hind foot (moistened) 32·5.

<sup>1</sup> Preliminary diagnosis in Minutes of P. Z. S. for June 15, 1897 (published June 19).



Dimensions of skull, see next page.

*Type.* B.M. 97. 3. 1. 4.

This Rat is one of the group allied to *Mus rattus*, so widely distributed over the East Indian Archipelago. The Bornean examples of the group I have provisionally termed *M. neglectus*, Jent., and have hitherto also used this name for Philippine specimens. The five highland Mindoro skins before me are, however, so uniformly different from any other specimens seen that they evidently ought to have a distinctive name.

On the other hand, as already noticed, a coast-level specimen from Mindoro is in no way separable from ordinary Philippine examples of *M. neglectus*. No doubt the highland forms are more or less indigenous, while those from the coast have been more lately introduced.

"I obtained several specimens of a variety of *Mus rattus* as high as 5000 feet in the forests of Mount Dulangan, Mindoro, and also on the Canloan volcano in Negros at an altitude of over 6000 feet. Like all the forms of *Mus rattus*, they were a great nuisance, entering my tent at night and biting holes in my rice-bags, often running over my body.

"The specimens from the two islands differ slightly in outward appearance of the fur. The Mindoro Rat is peculiar in being of a much darker brown on the back, and the belly is mouse-grey. The fur is fine and short, and the tail is nearly black. The Negros specimens, on the other hand, are more common looking, sandy brown on the back, with the underparts nearly white; the fur is also much longer, and the tail grey. *Mus rattus* seems to turn up in some form or other over the whole world, especially on high mountains."—J. W.

#### MUS CHRYSOCOMUS Hoffm.

*a. ♂.* Monte Data, Lepanto, 8000 feet, Feb. 1895.

This interesting species, which differs from almost every other member of the genus in the entire absence of sharp supraorbital edges or ridges, has hitherto been recorded only from Celebes. The present specimens, however, seem to agree closely both with Herr Hoffmann's description and figure, and also with the notes which, by the kindness of Dr. Meyer, I was allowed to take on the typical specimen when in Dresden.

"Common in the potato-fields on the top of Monte Data."—J. W.

#### MUS EPHIPIUM NEGRINUS subsp. n.

*a, b. ♂ ♀.* Negros, 6600 feet. *a*, type.

*c. ♂.* Monte Data, Luzon, 8000 feet, Feb. 1895.

Similar in essential characters to the small, coarse-haired, brownish or rufous animal

known as *M. ephippium*, Jent., but rather larger, much longer and softer furred, and more greyish smoky in colour.

Fur long and soft, the wool-hairs about 15 and the longer hairs 18 millim. in length on the back. General colour dark smoky grey, almost blackish along the middle of the back, lightening to buffy or yellowish on the sides. Belly not sharply defined, the hairs slaty at the base, yellowish white at the tip. Hands and feet silvery whitish above. Tail nearly as long as the head and body, uniformly brownish, or slightly paler below.

Dimensions of the type, an adult male, in skin:—

Head and body (apparently much stretched) 155 millim.; tail 135; hind foot (moistened) 26·5.

Skull, see below.

This is evidently an insular highland form of the common little Rat spread over the Malay Archipelago, to which I have generally applied the name of *Mus ephippium*, but which will perhaps be found to grade into the earlier described *Mus concolor*, Bly. In any case, however, the highland form now described seems worthy of subspecific distinction.

“Common among the Igorrote sweet-potato fields on the top of Monte Data.”—J. W.

*Skull-dimensions (in millim.) of Species of Mus, Batomys, and Carpomys.*

	<i>Mus luzonicus.</i> ♀.	<i>Mus mindorensis.</i> ♂.	<i>Mus ephippium negrinus.</i> ♂.	<i>Batomys granti.</i> ♂.	<i>Carpomys melanurus.</i> ♂.	<i>Carpomys phœurus.</i> ♂.
Basal length .....	44	36	(Lambda to nasal tip 30·3.)	40·5	39·3	36
Basilar length .....	40·2	32·8		37	36·3	33
Greatest breadth .....	25·7	19·5	16	22·2	24·5	23
Nasals, length .....	19·8	14·5	13·1	19·5	16	14·5
„ breadth ..	5·9	4·7	3·6	5	5·6	4·6
Interorbital breadth .....	7	6·1	5·2	5·5	5·2	6·1
Interparietal, length .....	5·3	5·6	—	5	6·1	4·8
„ breadth .....	11·6	11	—	9·6	11	13
Anterior zygoma-root, length.....	6·1	3·8	3·6	4·5	5·1	3·8
Palate, length from henselion .....	23	19	16	19	19	16·4
Diastema .....	13·5	11·2	9·7	12·8	12	11
Anterior palatine foramina, length.....	3·2	7	6·5	8·5	7·8	7·7
„ „ combined breadth.	3	2·6	2·5	3·1	2·7	2·8
Length of upper molar series .....	9·3	6·5	5	7·8	8·8	6·1
Lower jaw, condyle to incisor-tip .....	33·2	26	22	30·2	29·5	26·6
„ bone only .....	31	23·2	19·7	26·7	27	24

## BATOMYS THOS.

*Batomys* Thos. Ann. Mag. N. H. (6) xvi. p. 162 (1895).

General external form very much as in *Carpomys*, but with a shorter, though similarly hairy, tail. Eyes surrounded by a distinct naked, or at least very finely haired, ring, a peculiarity which forms one of the readiest means of distinguishing *Batomys* from *Carpomys* externally. Fore feet rather elongated; pollex with a nail. Hind feet broad; sole-pads as usual six in number, but all very large, and both the fourth (hallucal) and fifth (usually small and rounded) elongated like the sixth; pads not striated. Whole of heel hairy to the level of the hinder end of the last sole-pad. Fifth hind toe reaching to the base of the third phalanx of the fourth; hallux just to the base of the second toe.

*Skull* (Pl. XXXVI. fig. 8) more elongate and murine than that of *Carpomys*, in general outline not unlike that of *Eliomys quercinus*. Brain-case small, face comparatively long. Interorbital space rather narrow, its edges with only the slightest indication of ridges. Interparietal fairly large. Anterior edge of zygoma-root not projected forwards. Anterior palatine foramina large. Bullæ small.

Incisors narrow, smooth in front. Molars (Pl. XXXVI. fig. 5) in their pattern like those of *Mus*, not of *Carpomys*, but instead of being distinctly brachyodont, as are those of nearly all other Murines, they are more or less hypsodont, the crown at least as high above the bifurcation of the roots as it is broad. Molar laminae, as in *Mus*, 3—2—2; transverse, not oblique;  $m^2$  and  $m^3$  with well-defined antero-internal supplementary cusps.  $M_1$  and  $m_2$  also with distinct posterior mesial supplementary cusps.

This genus, although with a striking external resemblance to *Carpomys*, is really more nearly allied to *Mus*, as its elongate skull and the pattern of its molars indicate. Its curious bare eyelids and hypsodont molars are, however, characters in which it is different from all the other Eastern arboreal genera.

## BATOMYS GRANTI Thos. (Plate XXXIII. fig. 2.)

*Batomys granti* Thos. t. c. p. 162.

*a-c.* 2 adult and 1 immature. Monte Data, Feb. 1895.

Size of a large Rat. Fur thick, close, and rather coarse. General colour coarsely grizzled fulvous and black all over above, the face, however, more greyish; posterior back and rump tending more towards rufous. Ears of medium length, more thinly haired than in *Carpomys*, their backs black or dark brown. Under surface dirty buff, not sharply defined; the bases of the hairs slate-colour throughout, though an indistinct whitish mesial line is sometimes present. Metacarpals and metatarsals brownish mesially, whitish laterally and on the digits. Tail thickly and uniformly



clothed (except for its body-furred basal half-inch) with dark brown or black hairs, some 7 to 9 millim. in length, the scales quite hidden.

Skull and teeth as already described. Palatine foramina just reaching backward to the front edge of  $m.^1$ ; palate ending behind opposite the posterior lamina of  $m.^2$ .

Dimensions of the type, an adult male in skin:—

Head and body 204 millim.; tail (doubtfully perfect) 121; hind foot (moistened) 35.5.

Dimensions of skull, see p. 404.

*Hab.* Plateau of Monte Data.

*Type.* B.M. 95. 8. 2. 15.

This interesting animal, which, with very much the general appearance of *Carpomys melanurus*, is entirely different in essential characters, I have named in honour of my friend and colleague Mr. W. R. Ogilvie Grant, by whom all the business matters connected with Mr. Whitehead's expedition were managed, and who has himself worked out and described the magnificent collection of birds, which contained examples of no less than fifty new species.

"This interesting new Rat was captured for me by the Igorrotes, with the aid of their small terriers; it seems rare, only three specimens being obtained. *Batomys granti* is at first sight the same animal as the next species, *Carpomys melanurus*, but has a bare ring round the eye, and when alive is easily separated from *Carpomys* by this character. The two animals, however, which externally appear almost identical, have the teeth so different that they have been separated by Mr. Thomas into different genera. Found at 7000 feet on Monte Data.

"*Distribution.* Highlands of Central Northern Luzon."—J. W.

#### CARPOMYS THOS.

*Carpomys* Thos. Ann. Mag. N. H. (6) xvi. p. 161 (1895).

Form more or less as in such arboreal Murines as *Hapalomys* and *Pithechirus*. Fur thick and woolly. Pollex with a large nail; other digits, including the non-opposable hallux, with claws. Tail long, well haired. Mammæ 0—2=4.

*Skull* (Pl. XXXVI. figs. 6 and 7) with a large rounded brain-case and short face. Supraorbital region without sharp ridges or overhanging ledges. Interparietal large; zygoma-root as in *Crateromys*, i.e. without any forwardly-projecting plate, the front edge vertical or even concave. Anterior palatine foramina fairly long. Bullæ small.

*Teeth* (Pl. XXXVI. fig. 3). Incisors smooth in front. First and second upper molars, as compared with those of *Mus*, each with an additional lamina, formed apparently by the normal posterior lamina being doubled round on itself. The last molar is normal, so that the laminar formula is 4—3—2. Both  $m.^2$  and  $m.^3$  have well-marked antero-internal supplementary cusps. In the lower jaw  $m._1$  has an additional lamina in front, and both it and  $m._2$  have well-marked posterior supplementary cusps, while the last-named has in addition an antero-external one.

It is difficult to decide what are the exact relationships of *Carpomys*, and it can only be said that it adds one more to the list of Oriental genera of Muridæ modified for an arboreal life, such as *Ilapalomys*, *Pithechirus*, *Chiropodomys*, and *Vandeleuria*.

This new genus contains two handsome Dormouse-like species with long hairy tails and fluffy fur. Both are evidently of arboreal habits.

With a certain superficial resemblance to each other, the two species of *Carpomys* may be readily distinguished by their differently-coloured tails, the extension of the body-fur on to that organ in *C. melanurus*, and by the very much larger teeth, both absolutely and proportionally, of the same species.

*CARPOMYS MELANURUS* Thos. (Plate XXXIV. fig. 2.)

*Carpomys melanurus* Thos. Ann. Mag. N. H. (6) xvi. p. 162 (1895).

*a-d.* 3 ad. & 1 yg. sks., ♂ ♀. Monte Data, 7000–8000 feet, Feb. 1895.

Size about as in *Mus rattus*. Fur soft, thick, and woolly. General colour deep fulvous, coarsely lined with black. Under surface and inner sides of limbs dull yellowish white, the bases of the hairs slate. Ears of medium size, well haired, dark brown, nearly black. Limbs to wrists and ankles furred and coloured like body. Metapodials brown mesially, laterally and on the digits white. Tail longer than head and body, its basal inch or two thickly furry like the body, and of the same colour; the rest closely covered with shining black hairs, some 5 to 7 millim. in length, entirely hiding the scales; not specially tufted at tip.

*Skull* (Pl. XXXVI. fig. 6) with the nasals broad in front, abruptly narrowing backward. Interorbital region narrow, broader in front than behind, and the traces of ridges mounting on to the top, and approaching each other to within 2 millim. in the middle line. Palatal foramina parallel-sided, attaining at once their greatest width anteriorly. Palate ending opposite the front edge of *m*.<sup>3</sup>.

Teeth broad and heavy. Incisors broad, slightly flattened in front in old specimens; dark yellow above, rather more whitish below. Molars (Pl. XXXVI. fig. 3) very broad and large (see skull-measurements), their combined length exceeding that of the palatal foramina.

Dimensions of the type, an adult male, in skin:—

Head and body 197 millim.; tail 211; hind foot (moistened) 34.2.

Skull, see p. 404.

*Type.* B.M. 95. 8. 2. 12.

"The black-tailed *Carpomys* differs much from the next species, *C. phæurus*, both in size, colour, and length of fur; in fact it has externally the appearance of *Batomys*. On Monte Data, where both these new forms were obtained, it was more numerous than either *Batomys* or the next species.

"*Distribution.* Highlands of Central Northern Luzon."—J. W.

## CARPOMYS PHLEURUS Thos. (Plate XXXIV. fig. 1.)

*a-c.* 3 ad. sks., ♂ ♀. Monte Data, 7000–8000 feet, Feb. 1895.

Size rather less than in *C. melanurus*. Quality of fur and general colour almost exactly as in that species. Ears rather smaller, less thickly hairy, and not prominently black. Belly-hairs dull buffy white to their roots, not slaty basally. Tail with the body-fur not extending on to its base more than in ordinary Rats, more thinly haired than in *C. melanurus*, so that the scales, which are very small, running about 13 to the centimetre, are visible through the hairs; in colour it is uniformly dark brown, occasionally approaching black, but never the deep shining black of *C. melanurus*.

*Skull* (Pl. XXXVI. fig. 7), as compared with that of *C. melanurus*, with the nasals less expanded anteriorly and less abruptly tapering posteriorly. Interorbital space comparatively broad and parallel-sided, the rudimentary ridges not approaching each other on the top. Palatal foramina pointed in front, gradually broadening backward. Palate ending opposite to front of *m*.<sup>3</sup>.

Teeth light and delicate. Incisors comparatively narrow. Molars, in marked contrast to those of *C. melanurus*, quite small in proportion to the size of the animal, but of the same essential structure.

Dimensions of the type, an adult male in skin:—

Head and body (stretched) 195 millim.; tail 178; hind foot (moistened) 31.

Skull, see p. 404.

*Type.* B.M. 95. 8. 2. 14.

“The brown-tailed *Carpomys* was somewhat rare on Monte Data. The Igorrotes used to hunt for the various Rats on Monte Data in small parties accompanied by their dogs, and spent most of the day at this—to them—curious occupation. The animals that I saw captured were dug out from among the roots of trees by the aid of spears and choppers. The flat table-top of Monte Data is much burrowed by various species of Rodents; the Igorrotes, unlike the Kina Balu Dusans, not trapping Rats for their food.

“*Distribution.* Highlands of Central Northern Luzon.”—J. W.

## CRATEROMYS.

*Crateromys* Thos. Ann. Mag. N. H. (6) xvi. p. 163 (1895).

Size very large; general form not unlike that of *Phlæomys*. Claws smaller and tail bushier than in that genus.

*Skull*, in a very general way, not unlike that of a gigantic *Neotoma*, strikingly different from that of *Phlæomys*. Muzzle slender. Zygomata squarely and boldly expanded. Interorbital region narrow, narrowing backward, edged with distinct but not exaggerated ridges, which pass backward on to the parietal and interparietal bones, and show no tendency to overhang the temporal fossæ. Interparietal large.



Palatal foramina long. Outer and inner pterygoids well developed. Bullæ very small, though more inflated than in *Phlæomys*.

Incisors not large in proportion to the size of the animal, flat in front. Molars (Pl. XXXVI. fig. 2) large and heavy, separated in the middle line by a distance less than their breadth; rather hypsodont, though less so than in *Batomys*; their pattern, while in the number of laminae and cusps essentially as in *Mus*, yet peculiar on account of the diminution or suppression of the external and the great development of the internal cusp of each lamina. On this account the longitudinal groove between the inner and middle cusps, in which the inner cusp-row of the lower molars works, approaches the centre of the tooth-row, instead of being close to its inner edge. As an accompaniment to this development of the inner cusp of each lamina, the point of separation between it and the centre cusp is marked by a sharp and deep infolding of the anterior enamel wall of the lamina; this notch is so deep in many cases as almost to cut the lamina in two. Below, the two halves of each lamina are strongly bent backward, so as to form a sharp angle with each other in the middle line.  $M_1$  and  $m_2$  with well-developed supplementary posterior cusps;  $m_3$  with its posterior lamina sharply notched in behind, so as to give it a very definite cordate shape.

Altogether the molars have a general resemblance to those of the remarkable *Mus meyeri*, Jentink, an animal which (as may be seen from the footnote <sup>1</sup>) I think should also form a peculiar genus.

CRATEROMYS SCHADENBERGI (Mey.). (Plate XXXVI. fig. 2.)

*Phlæomys* (?) *schadenbergi* Mey. Abh. Mus. Dresd. 1894-5, no. 6 (1895).

*Crateromys schadenbergi* id. op. cit. 1896-7, no. 6, p. 32, pl. xiii. figs. 3-6 (skull), xiv. (animal) (1896).

a-c. Monte Data, Feb. 1895.

This fine animal was first discovered by Dr. Schadenberg, but it is to Mr. Whitehead that our chief knowledge of it is due, as the former's specimen was only a skin without

<sup>1</sup> LENOmys g. n.

Form Rat-like. Feet short and broad; pollex forming a large rounded projection of the hand, on the top of which the small nail is placed; hallux short, not opposable, its terminal pad large, covering nearly the whole of its under surface, its claw shorter, blunter, and more curved downward than those of the other digits; palmar and plantar pads all very large.

Molars (Pl. XXXVI. fig. 1) very large, the space between them less than their breadth. All three cusps of each lamina very strongly defined, the points of junction on each side of the central cusp marked anteriorly by a notch, and posteriorly by a backward projection of the enamel.  $M^2$  and  $m^3$  have, besides the usual antero-internal supplementary cusp, another one to balance it antero-externally, while the latter tooth has also a mesial supplementary cusp posteriorly. Lower molars very like those of *Crateromys*, but  $m_1$  has two, and  $m_2$  has one supplementary external cusp. These characters may be seen in the figures of the skull quoted below and in that of the teeth on Pl. XXXVI.

Type. *Mus meyeri*, Jent. N. L. M. i. p. 12 (1878); Cat. Ost. Leyd. Mus. (M. P.-B. ix.) p. 211, pl. vii. figs. 5-8 (1887); Hoffmann, Abh. Mus. Dresd. 1887, no. 3, fig. 2.

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a skull, which Dr. Meyer placed, not unnaturally, in the genus *Phlæomys*. On the arrival of Mr. Whitehead's series, the form was generically separated by myself, and a little later Dr. Meyer published a second account of the animal, with coloured figures. No further description of it is therefore necessary.

"Schadenberg's great Rat seems to be fairly common among the high mountains of Central N.W. Luzon. Like most Rodents, it is of nocturnal habits, and therefore the domestic economy of this Rat, or perhaps Squirrel-Rat, is difficult to describe. The Igorrotes, however, captured a number of specimens for me, some, they said, from holes in trees, others from holes among the tree-roots; they described the animal as feeding on fruits up in the trees, and not on the fallen ones. As this Rat was nearly always brought to me alive, I often allowed it to climb the pine-trees, which it did with perfect ease. In the day these animals tried to hide from the sun as much as possible, and I formed an opinion that they were dull and inoffensive creatures, until one day, directly an Igorrote opened the basket in which he carried the captured Rat, the animal sprang out, and was back in the basket again in a second, but the Igorrote's thumb had the top nearly bitten off. The cry of the *Crateromys* is a curious 'Thewō thewō thewō,' uttered so shrilly that the notes might proceed from some of the peculiar forest insects.

"Generally speaking, *Crateromys* is jet-black; about 30 per cent. are of a beautiful white-grey, and some 15 per cent. piebald, black and white. This distribution of colouring has nothing to do with age, as both grey and black young ones were obtained. The Igorrote name for this curious mammal is 'Bū-ūt.'

"*Distribution.* High mountains of Central Northern Luzon."—J. W.

#### BUBALUS MINDORENSIS Heude.

*Bubalus mindorensis* Heude, Mém. Hist. Soc. Chin. ii. p. 50 (1888); Meyer, Abh. Mus. Dresd. 1896-7, no. 6, p. 12 (1896).

*Probubalus mindorensis* Steere, P. Z. S. 1888, p. 415.

"This interesting little Bovine is not uncommon in the huge virgin forests that cover nearly the entire island of Mindoro. It is, however, difficult to hunt the animal successfully, unless a number of beaters, accompanied by good dogs, are employed. I foolishly followed a professional (!) native hunter about for several days; but, although we found a number of fresh tracks, we never saw a sign of a 'Tamarau.' The 'Tamarau,' as the natives name this animal, is also found high up on the mountains. I have seen regular tunnelled pathways through the thick bamboo undergrowth which covers the mountain-sides above 6000 feet. But the animal is so small that one has to bend double or go on one's hands and knees, making it quite impossible to follow up the tracks. On moonlight nights the 'Tamarau' might be heard bellowing on the mountain-side, generally far away and above my mountain-camp. The aboriginals of Mindoro told me that they never attack the 'Tamarau,' being too much afraid of it;

the only reduction of its numbers is caused by a few sporting Spaniards and one or two professional Indian hunters.

“ *Distribution.* The island of Mindoro.”—J. W.

*SUS CELEBENSIS PHILIPPINENSIS* Nehr.

*a.* Head-skin and skull, ♂. Cape Engaño, N. Luzon. Presented by Mr. Whitehead.

“This Pig may be said to be ubiquitous throughout the whole Philippine group, passing the entire day in seclusion in the forests, and sallying forth at night into the maize- and rice-fields, where it does much damage.

“Native name ‘Babui.’”—J. W.

## EXPLANATION OF THE PLATES.

### PLATE XXX.

Fig. 1. *Harpyionycteris whiteheadi* (p. 384).

Fig. 2. *Nannosciurus samaricus* (p. 389).

### PLATE XXXI.

Fig. 1. *Celenomys silaceus* (p. 391).

Fig. 2. *Rhynchomys soricoides* (p. 398).

### PLATE XXXII.

*Chrotomys whiteheadi* (p. 392).

### PLATE XXXIII.

Fig. 1. *Crunomys fallax* (p. 394).

Fig. 2. *Batomys granti* (p. 405).

### PLATE XXXIV.

Fig. 1. *Carpomys phæurus* (p. 408).

Fig. 2. „ *melanurus* (p. 407).

### PLATE XXXV.

*Skulls and Teeth of Philippine Mammals.*

Figs. 1-4. *Harpyionycteris whiteheadi* (p. 384), fig. 2 nat. size, figs. 1, 3, and 4 twice nat. size.

Fig. 5. *Crunomys fallax* (p. 394), upper and lower molars, much magnified.

Fig. 6. „ „ skull, nat. size and twice nat. size.



- Fig. 7. *Rhynchomys soricoides* (p. 398), upper and lower molars, much magnified.  
Figs. 8, 9. *Chrotomys whiteheadi* (p. 392), molars, magnified, and skull nat. size.  
Fig. 10. *Rhynchomys soricoides* (p. 398), skull, nat. size.  
Figs. 11, 12. *Celenomys silaceus* (p. 391), molars, magnified, and skull, nat. size.

## PLATE XXXVI.

*Skulls and Teeth of Philippine Mammals.*

- Fig. 1. *Lenomys meyeri* (p. 409), upper and lower molar teeth, much magnified.  
Fig. 2. *Crateromys schadenbergi* (p. 409), upper and lower molar teeth, much magnified.  
Fig. 3. *Carpomys melanurus* (p. 407), upper and lower molar teeth, much magnified.  
Fig. 4. *Mus luzonicus* (p. 401), skull, nat. size.  
Fig. 5. *Batomys granti* (p. 405), upper and lower molar teeth, much magnified.  
Fig. 6. *Carpomys melanurus* (p. 407), skull, nat. size.  
Fig. 7. „ *phæurus* (p. 408), skull, nat. size.  
Fig. 8. *Batomys granti* (p. 405), skull, nat. size.

All the enlarged figures of the molar teeth, upper and lower, are of those of the right side; the figures of the upper molars are placed on the left, and those of the lower on the right.

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1.

1 HARPYIONYCTERIS WHITEHEADI.  
2. NANNOSCIURUS SAMARICUS.



1. *PELLANOMYS SILACEUS*  
2. *RHYNCHOMYS SORICOIDES*







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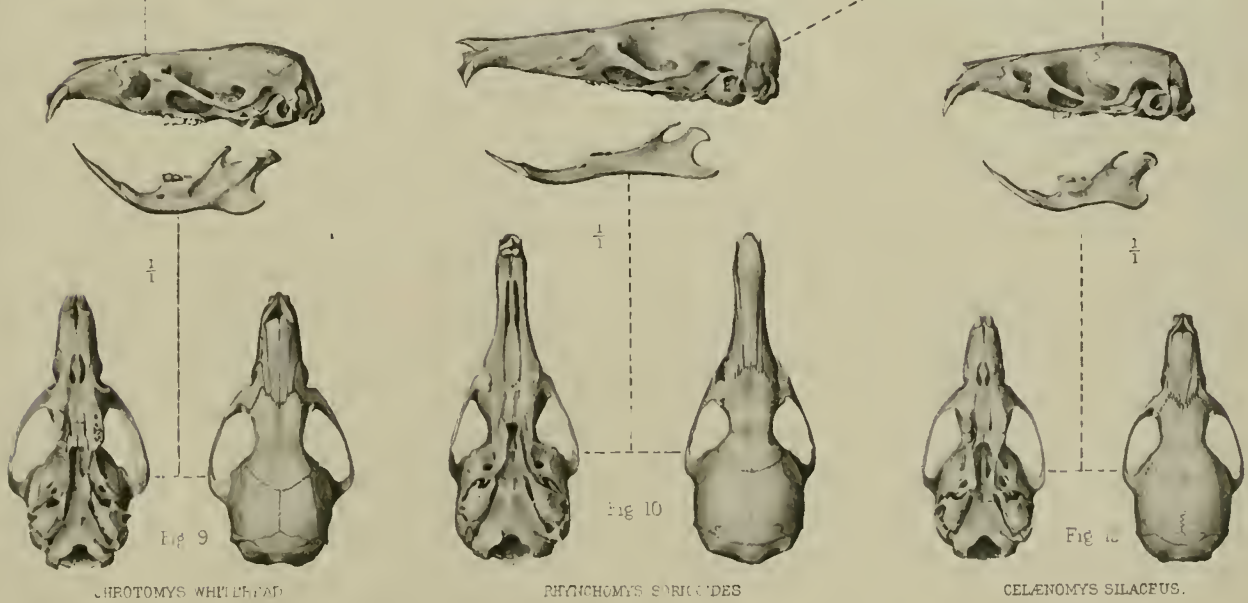
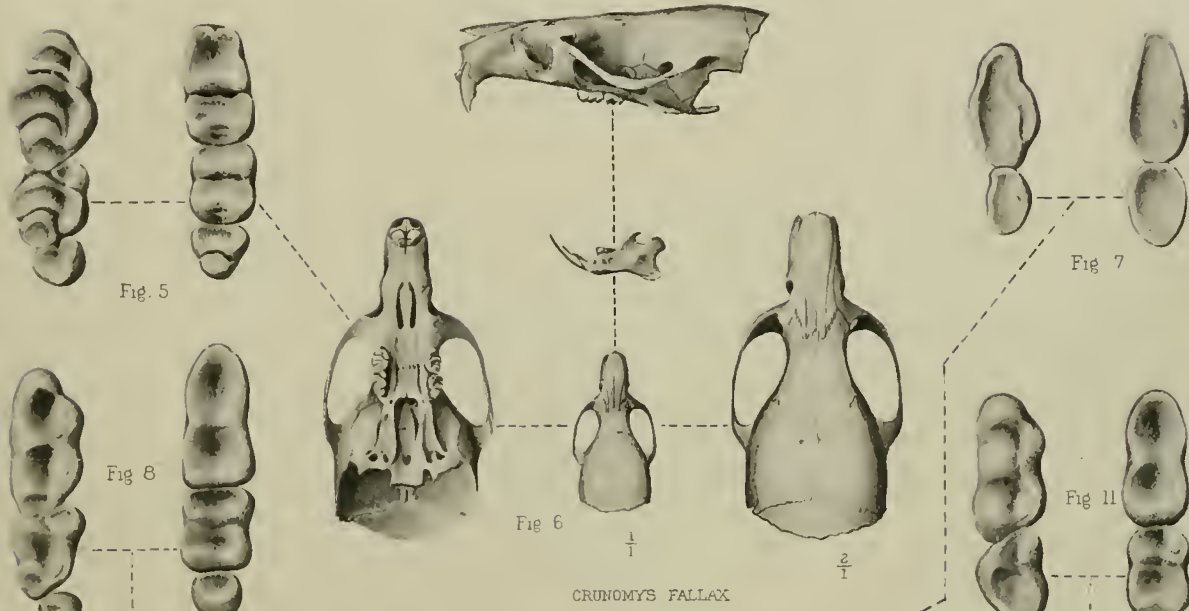
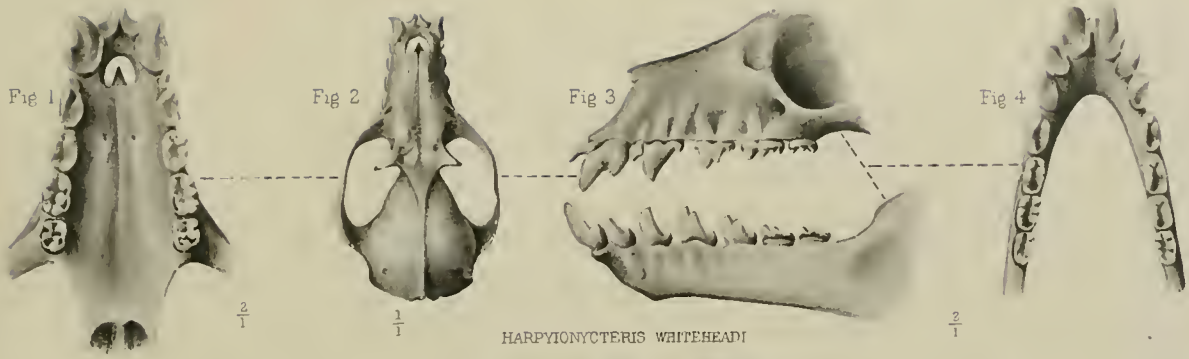
1 CRUNOMYS FALLAX  
2 BATOMYS GRANTI

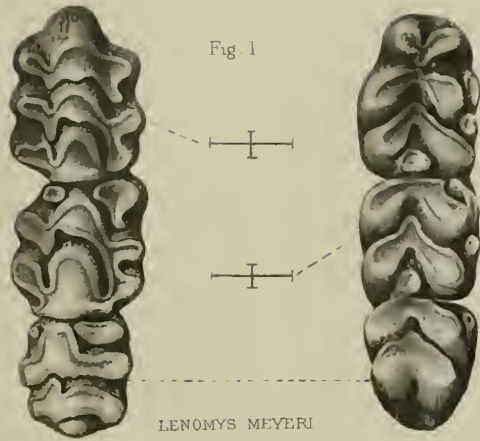
1.

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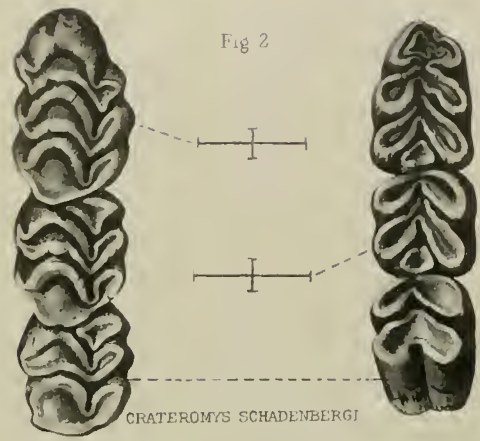
1 CARPOMYS PHÆURUS.  
2. CARPOMYS MELANURUS







LENOMYS MEYERI



CRATEROMYS SCHADENBERGI

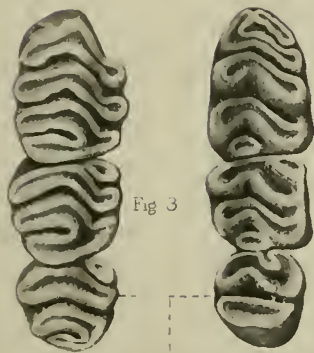


Fig 3

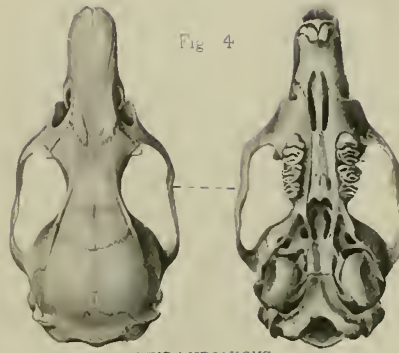


Fig 4

MUS LUZONICUS.

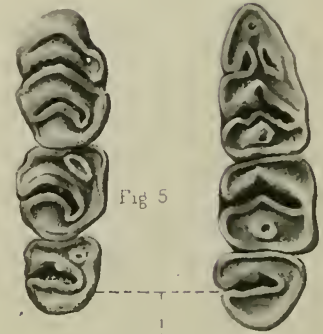


Fig 5

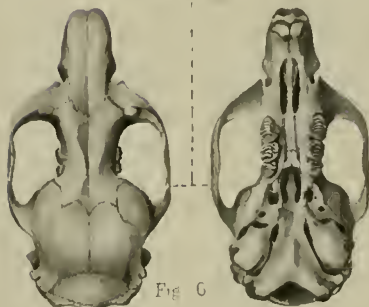
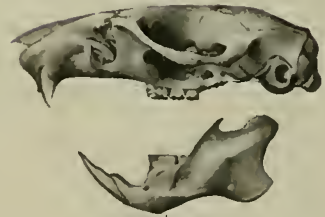


Fig 6

CAEPOMYS MELANOPUS

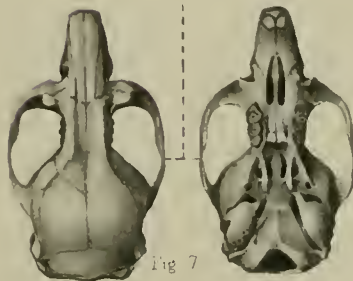


Fig 7

CAEPOMYS PHEURUS



Fig 8

RATOMYS GRANTI